Alberta
HUMAN RESOURCES AND EMPLOYMENT

the people & workplace department

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Occupational Injuries and Diseases in Alberta

Upstream Oil and Gas 1996 to 2000

Lost-Time Claims and Claim Rates

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1. Introduction

The Mission of Alberta Human Resources and Employment

Alberta Human Resources and Employment's mission is to foster safe and healthy workplaces. Workplace Health and Safety works within the continuum of services provided by Alberta Human Resources and Employment. Its focus is on the development and implementation of strategies and initiatives aimed at meeting the department's goal that Alberta will have a fair, safe and healthy work environment. To this end, Alberta Human Resources and Employment recognizes that monitoring workplace health and safety will help to ensure that primary concerns are actively managed and that resources are directed where needed.

This report summarises the lost-time injuries and disease descriptions, characteristics of the injured worker and the risk of injury to workers in Alberta's upstream oil and gas industries for the years 1996 to 2000. Cost of the injuries and revenue in terms of total premiums and the number of employers that received a Certificate of Recognition (COR) as a result of an external audit are also presented. Finally, a summary of occupational fatalities accepted by the WCB for compensation and brief descriptions of fatalities investigated by Occupational Health and Safety (OHS) are also provided.

The purpose of this report is to provide government, employers, workers, and health and safety officers in upstream oil and gas industries with information about the industry key health and safety issues.

Description of Upstream Oil and Gas Industries

The upstream oil and gas industries can be subdivided into the following sub-sectors.
Exploration, Oilfield Maintenance and Construction, Well Servicing with Service Rigs and Power Swivels, Drilling of Oil and Gas Wells, Oilfield Downhole and Other Services, Tar Sands, Petroleum Producers, and Oilfield Trucking Services.

The next section gives the descriptions of the sub-sectors.

2. Sector Descriptions

Sub-Sector # 1: Exploration

i. Seismic Geophysical/Mineral Exploration (Industry # 09200)

This industry involves conducting exploration using seismic technology for the purpose of locating formations beneath the earth's surface that may produce usable minerals such as coal, or oil and gas.

The basic procedure used to locate favorable formation beneath the earth's surface is to send shock waves into the ground, and record the patterns on seismic recording equipment.

When exploring for oil and gas, any one of the following three methods may be employed to create the shock waves:

1. Seismographic - Dynamite exploded in a shot hole;
2. Vibraseismic - tractor or truck mounted vibrators which are released to the ground at certain points; and
3. Vacuum Guns - truck mounted piston strikes base plate to send shock waves through the ground

When exploring for minerals, such as coal, shock waves are created by means of small hand tools. Larger equipment is not required as minerals formations are generally not located as deep below the surface as are oil and gas.

Sound waves are received through instrument referred to as geophones. The geophones are in turn wired to recording instruments that log the sound wave patterns. The data processing and analysis of the obtained information, may or may not, be part of the contract.

This industry does not cover shot hole drilling. This is normally subcontracted out to another company classified in industry 09201. Should an employer conduct drilling in conjunction with exploration, an additional industry is required.

Geophysical Exploration, other than seismic, is classified in industry 86405. The key difference is the generation and recording shock waves.

ii. Shot Hole Drilling (Industry # 09201)

The purpose of this industry is to drill bore holes for the purpose of holding explosives used in seismic exploration activities.

Shot hole drilling is performed with a small truck-mounted driller. This is normally a shallow drilling operation, drilling to a depth of 50 to 75 feet. This activity involves drilling only, as an exploration crew is responsible for placing and discharging the explosives. When the explosives are discharged or shot, the vibrations are recorded on a seismograph.

Sub-Sector # 2: Oilfield Maintenance & Construction

Oilfield Construction and/or Maintenance (Upstream of Processing Plants)(Industry # 06304)
This classification describes general contracting business that undertake turn-key construction and maintenance projects at facilities and lease sites upstream of gas plants.

Businesses may construct oil and gas wells, battery tanks, and compressor stations upstream of the processing facility. Construction activities may extend into ties-ins, installing/removing pumpjacks, dehydrators, and secondary construction activities of installing fences and gates. Maintenance activities may include painting, welding, pipefitting, cleaning oil spills, clearing a lease road, and maintaining the grounds in and around the site.

Sub-Sector # 3: Well Servicing With Service Rigs Including Power Swivels

Oil well servicing by means of service rigs including power swivels (Industry # 09903)
This industry is used to cover oil and gas well servicing operations, which are conducted with the use of well servicing rigs. Service rigs can be used on well completions once drilling operations have been completed to bring a producing well on stream as well as work over service to existing oil and gas wells. This industry is also used to cover the operation of power swivels used to replace working components of service rigs and work over units.

Service rigs are smaller and more mobile than drilling rigs, (smaller to a large mobile crane) and usually truck mounted. A service rig operator, derrick hand and two floor hands usually make up a service rig crew. Most service rig operators will have shop operations for structural and mechanical repair on their rigs.

Power Swivels are hydraulic motor driven pipe rotating machines specifically intended to replace the drilling swivels, the kelly stem, the kelly bushing and the rotary table on service rigs and work over units. They are trailer mounted and completely portable. Power swivel can be used to provide rotary power for the internal cutting of casing, drill pipe and tubing for drilling out packers, plugs, cement and other obstructions, for milling and scraping, drilling short distances, coring and as a utility tool in fishing operations.

Sub-Sector # 4: Drilling of oil and gas wells

Drilling of oil and gas well (Industry # 9600)
Oil well drilling is performed by independent drilling companies contracted directly to oil companies. Oil companies will coordinate the drilling program and may provide on site direction and supervision, but do not become physically involved in operating the drilling rig.

The drilling of gas and oil wells is carried out by small crew, including a rig manager (tool push), driller. derrick hand, motor hand, floor hands (roughneck) and lease hands. Drilling can be round-the-clock operations using shift workers.
The drilling of gas and oil wells involves the use of large heavy-duty rigs or derricks that may be capable of drilling several thousand feet into the earth. The equipment is set up at a predetermined location and drilling commences for two to four weeks. Considerable time is spent setting up the equipment; however, this is considered part of the drilling operations. Also included is the activity of leveling the drilling rig. This involves the use of heavy hydraulic jacks (50 to 100 tons) to raise or lower the oil derrick prior to drilling. Heavy timbers are used to stabilize where necessary. Due to tremendous torque or twisting pressure exerted by the drill stem, it is necessary that the rig be level.

Blowout control and well fire fighting are also in this industry. The procedure necessary to cap a wildcat well varies. Sometimes a blowout cab is brought under control by pumping mud or cement to stop the flow, or replacing valves on the blowout preventer. If a well catches fire, the fire must be extinguished before the well can be capped. A common method is to use explosives to cut off the fire's oxygen supply. Employers that are hired to set explosives for this purpose are covered in this industry.

Sub-Sector # 5: Downhole & Other Oilfield Services

*i. **Field Production Operators (Industry # 06305)***

This industry covers the 'contract' operation of upstream oil and gas production/processing facilities not classified elsewhere. This is primarily a labor service contracted to oil and gas producers for the routine day to day operation of facilities such as those described in industry 6300, including the operation of gas plants.

This is normally a daily responsibility. The duties of oil field production or gas well and battery operators will vary with different companies. Some may only be responsible for checking wellhead equipment. Others may work entirely at the battery and a majority of operators look after both wellhead and battery. If enhanced recovery methods are used on the well, Field Production Operators may operate these units in addition to their other duties.

Duties also include taking pressure and flow reading at the oil well, seeing equipment is running properly, checking flow lines, reading meters, looking for leaks, and may also involve working at the treater plant where samples may be required and reading needed on the levels of oil, gas, water and the addition of chemicals to the unit. At the water disposal unit, meters and gauges are checked, which measure pressure and water capacity levels to ensure there is sufficient space to hold the water coming in from the treating unit. At oil storage tanks, operators check pressure, storage capabilities and levels of the tanks. When gas is involved, operators check the Christmas tree which controls the flow and pressure of the well. They inspect valves, take readings of gauges, temperature, pressure and flow rate.

The operators and their helpers are responsible for routine maintenance and light housekeeping duties only when a condition of the contract to operate the facility.

*ii. **Vacuum Removal-Industrial, Commercial, and Oil Field(industry # 06306)***

This industry includes the vacuum truck removal or recovery of industrial by-products, pollutants, hydrocarbons, toxic waste and other liquid waste from oil wells, gas wells, refineries, heavy oil extraction plants, chemical plants and other industrial plants sites. It also includes the cleaning up of fertilizer, grain, sulphur and other dry waste products from industrial and commercial sites such as elevators and rail car derailment sites. Septic tanks and farm waste removal is also part of this industry.

Equipment used ranges in size from a single axle truck with small tank storage and moderate pumping power, to tandem and larger trucks with larger tank capacity and powerful pumping units.

The major feature of this industry is to recover and remove products from an employer's work site. The transportation of the product is an integral part of the services provided.

This industry includes hydro-trenching/hydro-excavating where water is applied under pressure to the ground creating a mud/slurry which is simultaneously vacuumed up by a truck, equipped with both vacuum and water ejection apparatus and holding tank.

The purpose is to expose pipe/utilities for further trenching and excavating without causing pipe ruptures.

iii. Mud Logging (Industry # 09900)

Employers engaged in hydrocarbon well/mud logging are included in this industry. Hydrocarbon well/mud logging is a procedure used in oil field drilling to log the strata and other pertinent details on a well during the drilling process.

Drilling mud is a mixture of pulverized barite, clays, chemicals and other various substances. Mud tanks and pumps are used to circulate the mud down the well bore during drilling operation. In addition to bringing cuttings to the surface, drilling mud cools and lubricates the bit and drill stem, protect against blowouts by holding back subsurface pressures, and deposits a mud cake on the wall of the borehole to prevent loss of fluids to the formation

A geological technician sets up at the drill site. Samples of drill cutting and gas, entrapped in the mud, are analyzed and the data recorded. They also analyze drill bit performance, rate of penetration and other information related to the drilling operations as required by the oil company. Log data and details are turned over to the oil companies for further study, and decisions concerning the drilling operations are made.
Equipment used to conduct the analysis includes chromatographs, total gas analyzers, U.V. box and microscopes.

iv. Pressure Cleaning Services (Industry # 09902)

These are mobile cleaning services conducted with the use of truck-mounted tanks equipped with pressure pumps that eject water, steam, air or hot oil for industrial, commercial or oilfield cleaning purpose.

Industrial and commercial applications will be cleaning of dirt, oil, grease or debris from anything ranging from buildings and plant equipment to rail cars and mobile equipment as well as flushing sewers and drains.
In the oil field, high-pressure air, water or steam is used to remove sand, wax and other debris from well site production equipment and storage tanks. This industry also covers pressure services using steam and hot oil treatments to clean paraffin from well casing and includes flush by services where truck mounted masts are used to lift sucker rods to allow a flush of the well.

Hot oil, water and steam treatments can be used for thawing of oil field equipment, storage tanks as well as pipelines, water and sewer lines.

v. Rathole Drilling And Service Rig Anchoring (Industry # 09904)

Prior to setting up a drilling rig to drill oil and gas wells it is necessary to drill a starter or conductor hole as well as holes for pipe stands known as rat and mouse holes. This is done with truck mounted drilling rigs. This industry is also used to cover the rig anchoring operations that install ground anchors primarily to secure service rigs during operations and also to secure flare stacks.

The oil company, or contractor arranges site survey and access to the area, and indicates where the holes are to be drilled. Unlike drilling or service rigs, where sections of the drill stem are used, a one-piece truck mounted auger is used in these operations. Three holes are drilled from 16 to 36 inches in diameter depending on requirements.

A conductor hole is drilled to a depth of 30 to 40 feet (the deepest may be 60 feet, but this is rare). A 16 or 19 inch pipe, or casing is put into the hole and cemented around the outside to hold it in place. The conductor hole is the main drill hole that the drilling rigs start their drilling operations in.

Rig anchoring services are completed with the use of truck mounted equipment, which will screw an auger type piece of iron into the ground until solid base is reached. The anchor is pull tested at 15 to 20,000 lbs. Safety cables are then used to secure service rigs or flare stacks to the anchors. Anchoring companies do not usually fasten the cables.

vi. Oil field Downhole Services (Industry # 09911)

This industry covers a wide spectrum of oilfield downhole services related to well completion, stimulation, testing and wireline services. This industry does not cover well servicing operations with the use of well servicing rigs. Employers in this industry usually offer a multitude of the above service to their clients with a variety of equipment, down hole tools and truck mounted units.

Services in this industry can include:

Directional drilling services involve only the supply of equipment and specialized supervision to the oil company. This work is done during the drilling process with the physical work or actual drilling done by the drilling crew.

Wireline services involve lowering special instruments into the well for testing purpose. A wireline may also be used to pull instrument or scrape debris out of the well.

Oil and gas well perforating involves lowering explosive device into the well on a wire line. When the required depth is reached, an electric current detonates the device. The explosive perforates the well casing, allowing the flow of oil at different levels.

Well testing activities include testing production levels. Production testing is performed by compressor equipment, usually truck mounted, which introduces water, air, or nitrogen into the line under high pressure and records information on pressure instruments. A separator may also be used to test flow or proportion of gas/oil and water in the flow.
Smaller hand held recording instruments may also be used for testing purposes. Dynamometers are surface instrument used to test downhole pumps and pump jack performance. Echometers are a downhole instrument used to log fluid levels and require the discharge of blank shell to generate shock waves, which are then recorded.

After a shot hole has been drilled, the hole is usually never used again and must be closed for environmental reasons. Shot hole cementers place a plug part way down the hole, then fill the hole with cement from the plug to the surface. *Cementing* also involves pumping cement downhole to secure the well casing.

Fracturing is the process of forcing, under high pressure, a mud-sand slurry with carbon dioxide or nitrogen to expand or fracture the formation, allowing the oil or gas to escape the well.

Chemical treatment involves forcing/injecting stimulation fluids into the well casing to clear contaminants. remove paraffin and hydrates for well stimulation.

Under balanced drilling is a down hole process where lighter drilling fluids are used to lubricate the drilling bit and drill stem. The purpose of this process is to reduce cost and reduce the need for well stimulation in completing the well.

vii. Well Casing Services (Industry # 09915)

This industry is intended to cover those employers who engage in a variety of services related functions on

active drilling rigs. Employers classified in this industry may engage in any one or more of the following activities:

Oil and Gas Well Power Tong Operations: Involves the use of large truck mounted hydraulic tongs to screw together or break apart sections of pipe (or casing) when being placed in, or removed from the drill hole.

Hydraulically operated Snubbing Units: Units are truck mounted and are used to move tubular products in and out of the oil or gas well which has pressure at the surface ('live well'). There is a hydraulic jack which clamps on to the pipe to control and overcome the forces on the tubular goods exerted by the well bore pressure. By moving the jack up and down, and releasing and resetting the clamps, the tubulars can be put into or removed from the well bore. The second part of the Snubbing Units is the blow-out preventers, which are also hydraulically operated and are used to control the pressure on the well. Snubbing services are used primarily in work overs and well completions; however, drilling contractors may also require their services.

Cleaning of Pipe Threads at Well Site: Prior to the casing being placed in the well hole, the pipe threads must be cleaned. Well casing crews clean the pipe threads using varsol, wire brushes and rags.

Transport Pipe at Drill Site: Pipe (or casing) found on a pipe rack approximately 100 feet away from the drilling rig, is transported to the rig floor by a carrier suspended on a wire cable running from a winch permanently mounted on a truck. These units used to transport the pipe are referred to as pickup/lay down units.

Torque Monitoring: Using a gauge or a computer monitoring system, the amount of torque applied when joining two joints of pipe together by means of power tong is monitored and controlled.

Employers that install blow-out preventers are also included in this industry.

viii. Servicing Christmas Trees on Oil Wells by Means of a Tree Saver (Industry # 09921)

An oil well 'Christmas tree' is a series of pipes and valves that are situated on the well head after drilling of the well has been completed. This equipment needs to be protected when fracturing a well.

The tree saver is a heavy gauged piece of pipe (approximately 2 metres long, 5 centimetres in diameter and weighs 90 kilograms), which is inserted through the Christmas tree and into the well tubing to prevent the fracturing fluid from wearing away at the valves and parts of the Christmas tree. The saver is held in place by means of a bolted coupling and rubber sleeve.

ix. Liquid Waste Treatment & Disposal (industry # 09927)

Employers in this industry are engaged in the chemical treatment and disposal of water in sump pits located on oil and gas well drilling sites.

It should be noted that employers who pump water to the drilling rig, from a nearby water source, by means of pumps and irrigation piping are also classified in this industry. The equipment used is the same as that of employers pumping water out of a sump pit, and it is part and parcel of the water system used in the drilling process.

Samples of the sump water are analyzed by independent laboratories to determine what treatment program may be implemented so as to separate the solid wastes from the liquid, and to make the liquid safe for return to the environment. The Energy Resources Conservation Board prior to its implementation must approve the treatment program. Once the waste treatment company has applied the recommended program, they must then send in a sample of the treated sump liquid to the E.R.C.B., who must verify that the treatment was successful. Once approved, the water is pumped out of the sump pit into the surrounding environment.

The solid wastes are often not harmful to the environment, and therefore left in the sump pit. Some employers will use a mechanical system (referred to as a centrifuge) through which they pump the sump pit waste in order to separate the solids from the liquids. Chemicals required to remove any impurities from the water are added to the system. The same E.R.C.B. standards discussed above must be adhered to.

Sub-Sector # 6: Tar Sands

i. Mining & Processing of Bituminous Sands for Oil Extraction (Industry # 06600)

The industry covers employers engaged in both the mining and the processing of bituminous sands which at this time is exclusive to the Athabasca oil sands deposits.

This is an open pit mining process that removes oil-laden sand from the earth and transports this sand to an extraction plant.

Draglines with booms measuring over 100 metres, are equipped with enormous buckets that dig up the oil sand. Bucket wheel excavators, equipped with a series of toothed bucket on a revolving wheel, are used to scoop up the sand and put it on conveyors or loaded onto specialized trucks for transport to an extraction plant. Bitumen is then separated from the sand, in the plant, by a series of automated units using steam and chemical agents. Once the raw bitumen is separated, it is upgraded into synthetic crude oil because it contains impurities, and it is too thick and heavy to flow through pipelines.

Upgrading units include the coker, which breaks down the bitumen into smaller molecules and the fractionator, which separates the bitumen products into gas, naphtha and gas-oil molecules, removing the impurities. Upgrading plants are comparable to oil refineries in many ways. The end product, synthetic crude oil, is shipped to refineries for further processing into other products such as gasoline, jet fuel and lubricating oil.

ii. Research & Development, Oil Sands & Heavy Oil Recovery (Industry # 06601)

Employers in this industry specialize in research and development into new technologies for recovering oil from heavy oil deposits and bituminous sand through 'in situ' or 'well' recovery methods.

Employers will design and operate test facilities for the research and development purpose. This is purely a research industry and is not intended for exploration or commercial processing activities. Once employers begin operating on a commercial basis, the operation would be classified in industry 06300.

Contract operators may be engaged to operate test facilities and would be classified along with other upstream production operators in industry 06305.

Sub-Sector # 7: Oil/Gas Exploration/ Development- Upstream Operations

Oil & Gas Exploration & Development-upstream operations (Industry # 06300)

This industry covers all 'upstream' oil field activities of employers, which generate revenue from the production, and sale of crude oil and/or natural gas. This includes both the small independent producer and major integrated oil and gas companies.

Oil and gas companies direct/control/evaluate/supervise oil and gas exploration and development; however, they subcontract the actual field operations prior to the production stage (i.e. seismic, drilling). In effect, they are general contractors for this phase of the industry.

The operations of all upstream production/processing facilities are covered under this classification when conducted by the owner/producer.

Oil or gas marketing firms, companies that are not producers but purchase product from other producers and resell, are considered part of this industry. They take title to the product and generate revenue from the sale of crude oil or natural gas.

Large oil companies may become involved in all aspect of oil exploration, processing and sale. Smaller companies may become involved only in the production and/or sale. Other companies may become involved in oil exploration purely on a speculative basis. All such employers are covered under this industry.

Upstream production facilities include:
- oil/gas well, well head equipment
- flow lines/gathering systems tied into field processing facilities
- battery sites/compressors stations
- crude oil separators and natural gas dehydrators/treaters
- natural gas/sulfur processing plants
- heavy oil projects including steam generation
- other enhanced recovery methods

Gas processing plants are normally located in the vicinity of the producing fields, and are tied directly into gas well through a network of gathering systems. This is considered to be an upstream production activity by the industry and is a common activity of major producers. Gas plants incorporate process technology, similar to refineries and petrochemical plants, for the purpose of removing impurities such as sulfur and water prior to transmission to the market.

Sub-Sector # 8: Oilfield Trucking Services

Oilfield Trucking Services (Industry # 50720)
This industry describes businesses that operate for-hire trucking equipment for the purpose or ability to transport oversized or overweight loads, off-highway loads, in the oilfield. Services in this industry include for-hire specialized trucking services to and from oil and gas lease sites, not described under Specialized Hauling (industry 50701), or bulk or tank truck hauling (industry 50714). Businesses may own or lease trucks, vehicles and equipment and shipping/receiving facilities or terminals. Business may opt to subcontract lease operators to provide trucking/delivery services, while only conducting scheduling, dispatching, and billing services in-house.

As most oil and gas lease sites are located in remote areas, vehicles are typically modified to operate in an off-road environment. Vehicles are usually equipped with positive air shut-offs. These attachments prevent engines from running once turned off, particularly in areas of highly combustible/explosive gases. The industry includes rig moving and operating pilot cars, and businesses in this industry may provide some highway hauling services using standard flatdecks and trucks in the course of a move.

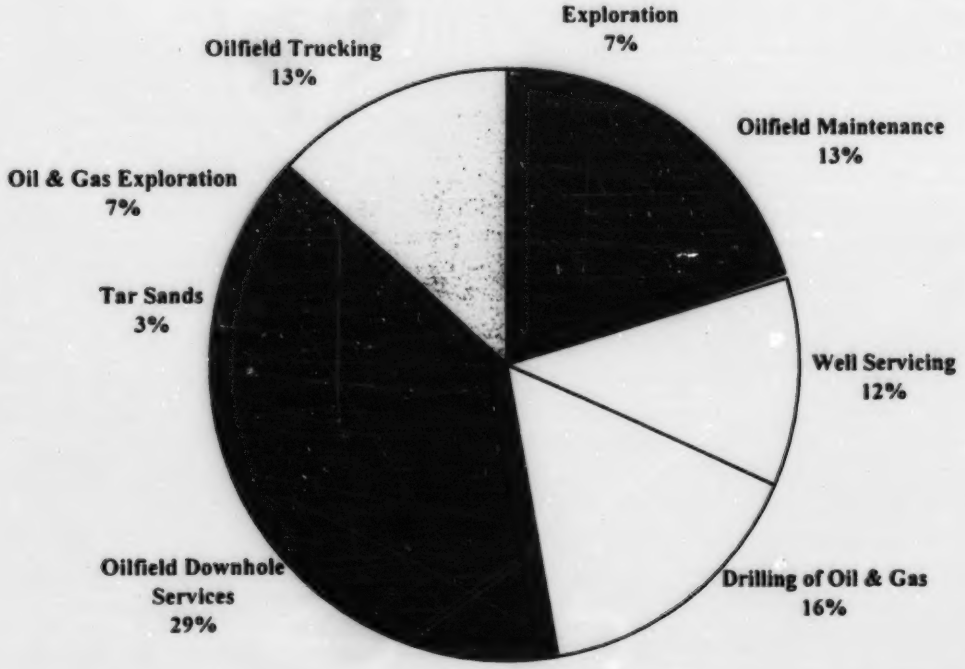
Business may utilize specialized trucking equipment with tire chains, skid plates, heavy-duty bumpers, winches, cherry pickers and may employ drivers, labourers (swampers), warehouse/yard staff, forklift drivers, mechanics, dispatch/traffic, sales/estimators, office/administrative staff.

3. Lost-Time Claim (LTC) and Duration Rates

All Upstream Oil & Gas Industries

Year	# of Accounts	Cost	Person Years	Days Lost	Duration Rate	LTCs	LTC Rate
1996	5,645	$9,364,951	72,485	54,843	76	1,303	1.8
1997	6,650	$12,696,143	80,484	66,661	83	1,645	2.0
1998	7,205	$11,476,578	82,714	61,219	74	1,281	1.5
1999	7,652	$7,047,271	74,016	50,429	68	1,111	1.5
2000	8,459	$12,940,332	73,064	65,780	90	1,544	2.1

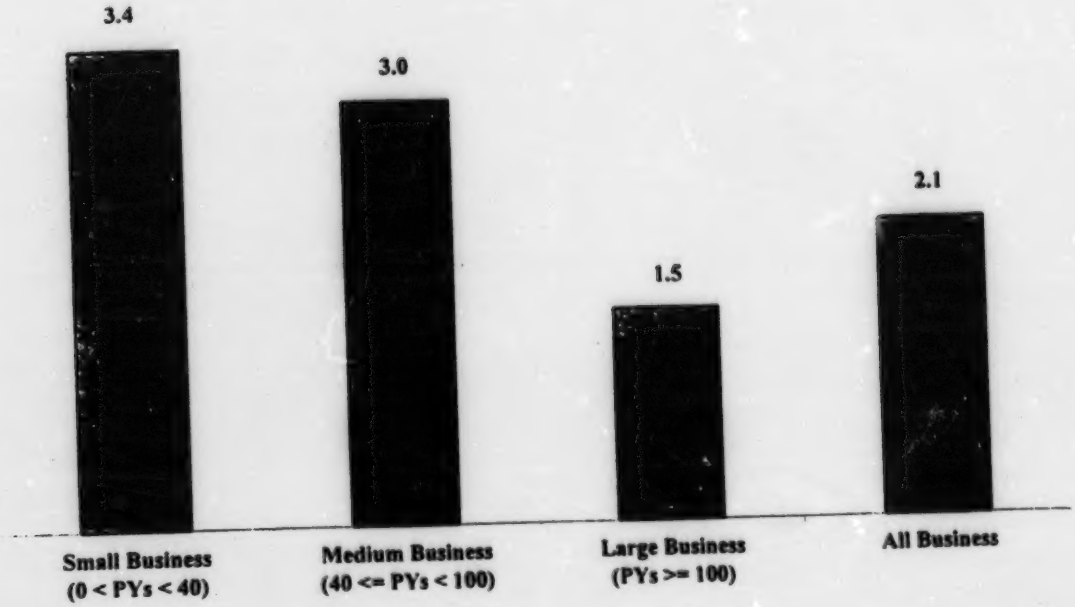
Lost-Time Claims by Sub-Sectors in The Upstream Oil/Gas Industries Alberta: 1996-2000



3.1 LTC Rates by Size[1] of Employer: 2000

Size of Employer	# of Accounts	LTCs	Person - Years	LTC Rate
A: 0 <= PYs < 1	5,740	74	2,923	2.5
B: 1 <= PY < 5	1,638	95	3,416	2.8
C: 5 <= PYs < 10	384	106	2,723	3.9
D: 10 <= PYs < 20	277	142	3,928	3.6
E: 20 <= PYs < 40	169	186	4,697	4.0
F: 40 <= PYs < 100	118	224	7,447	3.0
G: PYs >= 100	124	701	47,930	1.5
H: Invalid	9	16	N/A	N/A
Total	8,459	1,544	73,064	2.1

LTC Rate By Size of Employer
Alberta: 2000



[1] Size is measured in terms of estimated person-years (PYs)

3.2 Lost-Time Claim Rates by Sub-Sector

Sub-Sector 1-Exploration

Year	# of Accounts	Cost	Person Years	Days Lost	Duration Rate	LTCs	LTC Rate
1996	222	$808,650	2,605	5,097	196	117	4.5
1997	221	$640,472	2,880	5,898	205	122	4.2
1998	228	$532,225	2,711	3,967	146	80	3.0
1999	230	$256,120	2,224	4,784	215	74	3.3
2000	238	$1,313,970	2,807	4,817	172	112	4.0

Sub-Sector 2-Oilfield Maintenance

Year	# of Accounts	Cost	Person Years	Days Lost	Duration Rate	LTCs	LTC Rate
1996	778	$1,164,171	4,019	5,874	146	161	4.0
1997	858	$1,871,160	5,264	8,100	154	225	4.3
1998	901	$903,554	4,839	6,575	136	168	3.5
1999	920	$527,283	4,193	6,577	157	138	3.3
2000	925	$1,039,838	4,286	6,301	147	176	4.1

Sub-Sector 3-Well Servicing by Means of Services Rigs

Year	# of Accounts	Cost	Person Years	Days Lost	Duration Rate	LTCs	LTC Rate
1996	116	$1,418,965	4,293	8,832	206	146	3.4
1997	125	$1,543,160	5,055	10,254	203	211	4.2
1998	112	$1,991,375	4,886	9,264	190	158	3.2
1999	123	$1,112,458	4,197	6,448	154	137	3.3
2000	119	$1,691,165	3,989	7,390	185	163	4.1

Sub-Sector 4-Drilling of Oil & Gas Wells

Year	# of Accounts	Cost	Person Years	Days Lost	Duration Rate	LTCs	LTC Rate
1996	66	$1,986,527	5,700	10,747	189	197	3.5
1997	79	$2,661,066	6,871	13,995	204	289	4.2
1998	81	$2,221,502	6,077	11,475	189	182	3.0
1999	83	$1,336,103	5,137	7,899	154	133	2.6
2000	88	$3,206,349	5,707	17,454	306	287	5.0

Sub-Sector 5-Oilfield Downhole Services

Year	# of Accounts	Cost	Person Years	Days Lost	Duration Rate	LTCs	LTC Rate
1996	2,139	$2,253,290	14,151	14,252	101	366	2.6
1997	2,590	$2,652,673	17,275	14,949	87	438	2.5
1998	2,942	$3,959,219	17,374	19,077	110	388	2.2
1999	3,205	$2,210,463	16,304	13,733	84	343	2.1
2000	3,635	$2,968,770	17,343	18,187	105	482	2.8

Sub-Sector 6-Tar Sands

Year	# of Accounts	Cost	Person Years	Days Lost	Duration Rate	LTCs	LTC Rate
1996	11	$132,309	6,051	539	9	54	0.9
1997	11	$145,657	6,025	702	12	35	0.6
1998	14	$52,662	6,921	306	N/A	26	0.4
1999	16	$99,510	6,978	562	8	32	0.5
2000	15	$486,720	6,485	725	N/A	26	0.4

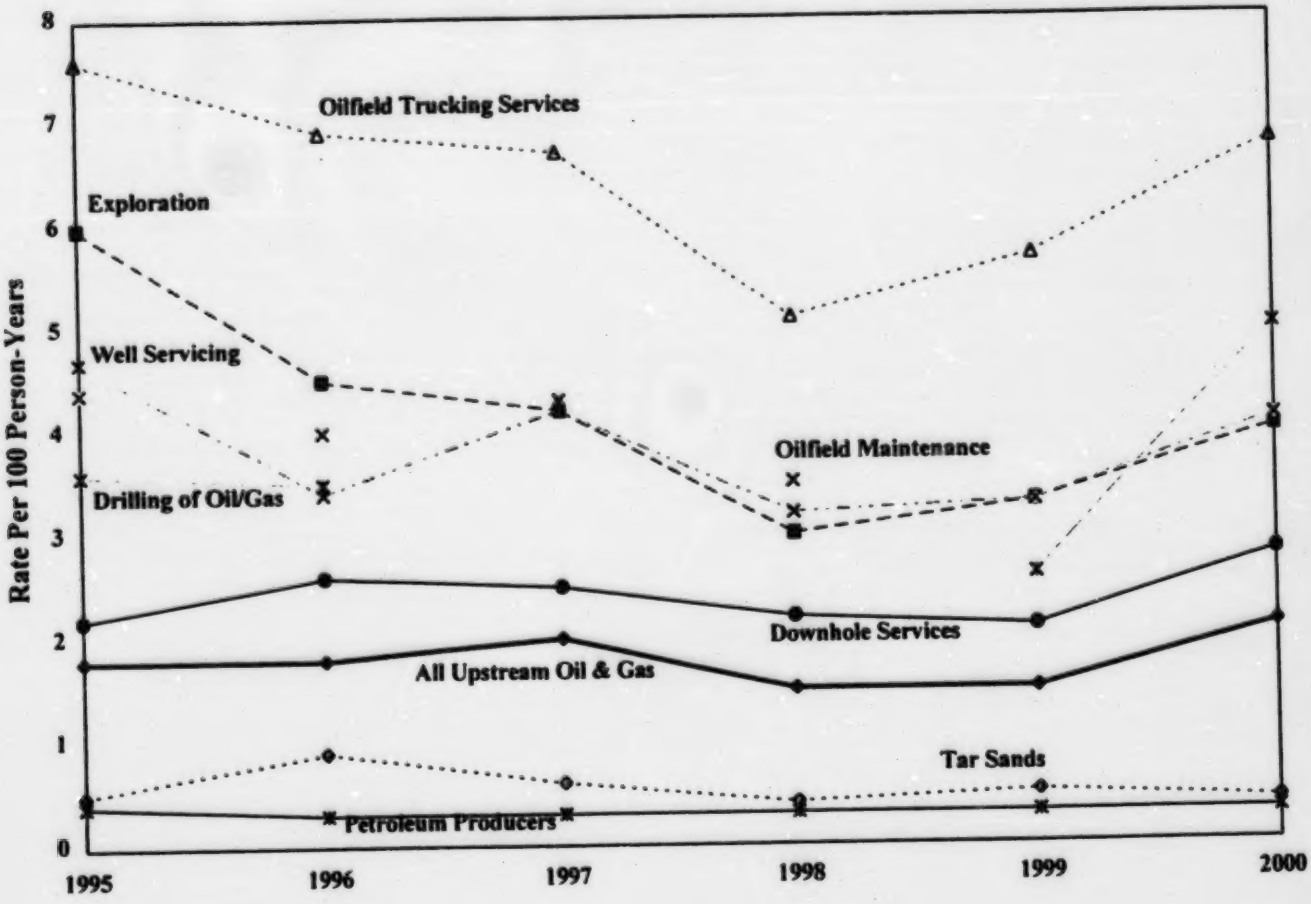
Sub-Sector 7-Oil/Gas Exploration & Development-Upstream Operations

Year	# of Accounts	Cost	Person Years	Days Lost	Duration Rate	LTCs	LTC Rate
1996	1,831	$673,641	33,410	1,890	6	107	0.3
1997	2,179	$1,810,837	33,765	3,430	10	100	0.3
1998	2,274	$643,090	36,596	2,788	8	111	0.3
1999	2,418	$659,516	32,275	2,736	8	101	0.3
2000	2,702	$855,709	29,385	2,078	7	90	0.3

Sub-Sector 8-Oilfield Trucking Services

Year	# of Accounts	Cost	Person Years	Days Lost	Duration Rate	LTCs	LTC Rate
1996	482	$927,398	2,255	7,612	337	155	6.9
1997	587	$1,371,117	3,348	9,333	279	225	6.7
1998	653	$1,172,951	3,310	7,767	235	168	5.1
1999	657	$845,818	2,707	7,690	284	153	5.7
2000	737	$1,377,812	3,063	8,828	288	208	6.8

Lost-Time Claim Rates
Upstream Oil & Gas Subsectors
Alberta: 1995-2000



Lost-Time Claim Rate	1995	1996	1997	1998	1999	2000
All Upstream Oil and Gas	1.8	1.8	2.0	1.5	1.5	2.1
Exploration	6.0	4.5	4.2	3.0	3.3	4.0
Oilfield Maintenance and Construction	4.4	4.0	4.3	3.5	3.3	4.1
Well Services with Service Rigs	4.7	3.4	4.2	3.2	3.3	4.1
Drilling of Oil and Gas	3.6	3.5	4.2	3.0	2.6	5.0
Downhole & Other Oilfield Services	2.2	2.6	2.5	2.2	2.1	2.8
Tar Sands	0.5	0.9	0.6	0.4	0.5	0.4
Petroleum Producers	0.4	0.3	0.3	0.3	0.3	0.3
Oilfield Trucking Services	7.6	6.9	6.7	5.1	5.7	6.8

4. Analysis of the Lost-Time Claims

4.1 Nature of Injury

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
SPRAIN, STRAIN, TEARS	404	593	446	373	508	2,324	33.8
FRACTURE/DISLOCATION	258	356	274	218	314	1,420	20.6
OTHER TRAUMATIC INJURY/DISEASE	145	146	134	156	238	819	11.9
SURFACE WOUNDS, BRUISES	165	204	135	121	187	812	11.8
OPEN WOUNDS	81	134	105	72	111	503	7.3
SYSTEMATIC DISEASES, DISORDERS	78	78	72	50	86	364	5.3
BURNS	64	52	69	50	63	298	4.3
NATURE - UNS	75	57	32	53	29	246	3.6
MULTIPLE DISEASE/DISORDERS	26	20	11	12	.	69	1.0
OTHER DISEASE/DISORDERS	2	2	1	4	4	13	0.2
SYMPTONS, SIGN/ILL	4	2	2	2	2	12	0.2
TUMORS, CANCER	1	1	.	.	.	2	0.0
INFECTIOUS/PARASITIC DISEASE	.	.	.	.	2	2	0.0
Total	1,303	1,645	1,281	1,111	1,544	6,884	100.0

4.2 Part of Body Injured

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
BACK	310	383	275	237	321	1,526	22.2
OTHER TRUNK	137	200	147	148	218	850	12.3
LEG(S)	160	194	147	132	173	806	11.7
ANKLE(S) & FOOT(FEET)-NOT TOES	151	173	137	120	187	768	11.2
FINGER(S)	113	162	149	99	144	667	9.7
HAND(S)	92	114	102	59	83	450	6.5
MULTIPLE BODY PARTS	76	85	65	115	105	446	6.5
OTHER HEAD	85	111	89	56	99	440	6.4
OTHER UPPER EXTREMITIES	64	81	62	64	77	348	5.1
EYE(S)-OPTIC NERVE,VISION	39	46	38	32	58	213	3.1
NECK	36	51	36	19	31	173	2.5
OTHER LOWER EXTREMITIES	25	29	21	19	35	129	1.9
BODY SYSTEMS	7	9	7	5	6	34	0.5
UNKNOWN	7	7	6	4	5	29	0.4
OTHER BODY PARTS	1	.	.	2	2	5	0.1
Total	1,303	1,645	1,281	1,111	1,544	6,884	100.0

4.3 Source of Injury

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
UNKNOWN	312	301	233	215	271	1,332	19.3
PARTS & MATERIALS	229	323	223	210	299	1,284	18.7
STRUCTURES/SURFACES	146	236	166	152	216	916	13.3
VEHICLES	142	196	139	128	167	772	11.2
PERSONS-INJURED WORKER	149	157	133	130	160	729	10.6
OTHER SOURCES	90	50	74	67	118	399	5.8
MACHINERY	47	82	. 68	42	77	316	4.6
CONTAINERS	52	76	69	50	64	311	4.5
HANDTOOLS-UNPOWERED	55	75	69	48	49	296	4.3
OTHER TOOLS/EQUIPMENT	14	52	32	23	28	149	2.2
CHEMICAL/CHEMICAL PRODUCTS	28	40	33	17	26	144	2.1
HANDTOOLS-POWERED	11	16	10	7	14	58	0.8
FURNITURE & FIXTURES	12	15	4	7	16	54	0.8
MINERAL-METALS/NONMETALS	7	13	11	3	17	51	0.7
OTHER PLANTS/ANIMALS/MINERALS	4	8	9	8	13	42	0.6
PERSONS-NOT THE INJURED WORKER	4	3	6	3	6	22	0.3
PLANTS & ANIMALS	1	2	2	1	3	9	0.1
Total	1,303	1,645	1,281	1,111	1,544	6,884	100.0

4.4 Type of Event/Exposure

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
UNKNOWN	160	113	66	92	119	550	8.0
STRUCK BY OBJECTS	195	297	214	167	258	1,131	16.4
OVEREXERTION	187	271	220	186	235	1,099	16.0
CAUGHT IN OBJECTS	120	186	144	98	162	710	10.3
TRANSPORTATION ACCIDENTS	120	159	106	106	143	634	9.2
BODILY REACTION	133	137	112	108	131	621	9.0
FALL TO LOWER LEVEL	90	147	113	79	93	522	7.6
FALL ON SAME LEVEL	90	109	86	97	135	517	7.5
EXPOSURE TO HARMFUL SUBSTANCES	90	78	90	56	84	398	5.8
STRUCK AGAINST OBJECTS	38	47	38	31	62	216	3.1
OTHER FALLS	26	40	27	27	47	167	2.4
REPETITIVE MOTIONS	15	18	15	20	21	89	1.3
RUBBED OR ABRADED	17	18	13	16	15	79	1.1
FIRES AND EXPLOSIONS	16	12	15	17	18	78	1.1
OTHER BODILY REACTION/EXERTION	3	5	9	8	16	41	0.6
OTHER CONTACT WITH OBJECT/EQUIP.	.	3	9	2	1	15	0.2
ASSAULT/VIOLENT ACT BY PERSON	3	2	3	1	3	12	0.2
OTHER ASSAULTS/VIOLENT	.	3	1	.	1	5	0.1
Total	1,303	1,645	1,281	1,111	1,544	6,884	100.0

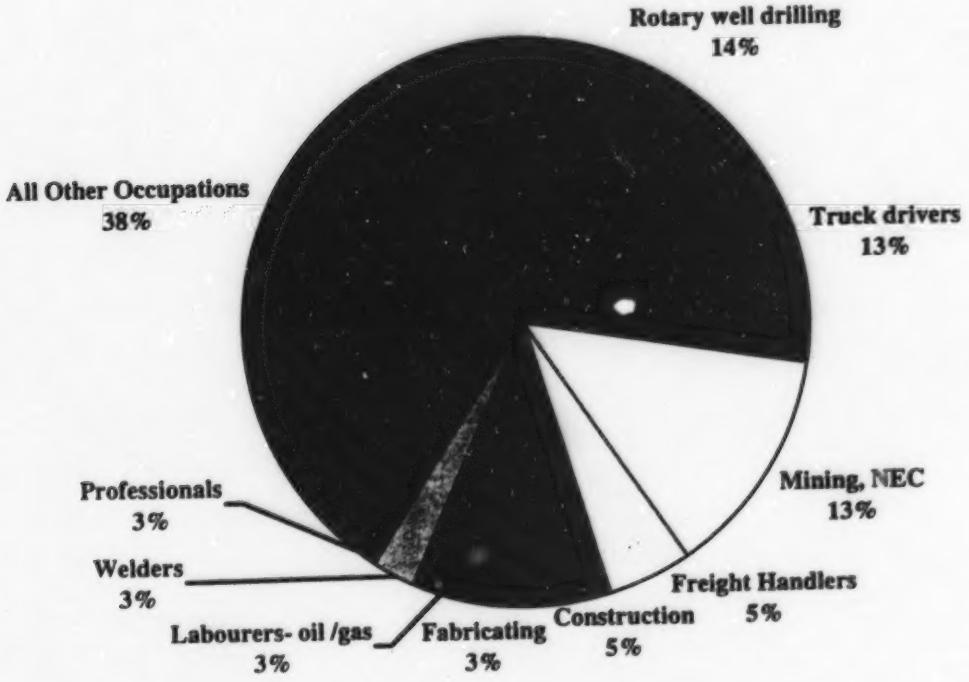
4.5 Duration of Disability

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
01 - 05 DAYS LOST	278	393	287	227	328	1,513	22.0
06 - 10 DAYS LOST	142	218	151	129	181	821	11.9
11 - 15 DAYS LOST	103	122	97	93	118	533	7.7
16 - 20 DAYS LOST	77	78	67	53	84	359	5.2
21 - 30 DAYS LOST	122	129	97	95	126	569	8.3
31 - 40 DAYS LOST	82	108	74	54	83	401	5.8
41 - 50 DAYS LOST	60	75	79	44	81	339	4.9
51 OR MORE DAYS LOST	352	407	334	328	405	1,826	26.5
DAYS LOST-UNSPECIFIED	87	115	95	88	138	523	7.6
Total	1,303	1,645	1,281	1,111	1,544	6,884	100.0

5. Characteristics of the Injured Worker

5.1 Occupation[2] of Injured Worker

Lost-Time Claims By Occupation of Injured Worker
1996-2000



[2] None of the individual occupations belonging to the 'all other occupations' category accounted for more than 2.0% of the total lost-time claims.

5.2 Age of injured Worker

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
15-19 YEARS	68	118	72	46	103	407	5.9
20-24 YEARS	239	356	265	246	331	1,437	20.9
25-34 YEARS	506	572	448	354	531	2,411	35.0
35-44 YEARS	338	434	332	299	369	1,772	25.7
45-54 YEARS	112	118	116	122	152	620	9.0
55-64 YEARS	37	41	45	37	45	205	3.0
65 YRS AND OVER	2	3	3	6	10	24	0.3
AGE-UNSPECIFIED	1	3	.	1	3	8	0.1
Total	1,303	1,645	1,281	1,111	1,544	6,884	100.0

5.3 Length of Time Employed

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
A. LESS THAN 1 MONTH	171	269	143	123	236	942	13.7
B. 1 MONTH TO < 6 MONTHS	259	411	279	208	338	1,495	21.7
C. 6 MONTHS TO < 1 YEAR	118	158	152	80	157	665	9.7
D. 1 YEAR OR MORE	393	397	337	373	347	1,847	26.8
E. TIME-UNSPECIFIED	362	410	370	327	466	1,935	28.1
Total	1,303	1,645	1,281	1,111	1,544	6,884	100.0

5.4 Gender of Injured Worker

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
MALE	1,244	1,582	1,218	1,060	1,476	6,580	95.6
FEMALE	34	34	47	36	51	202	2.9
GENDER-UNSPECIFIED	25	29	16	15	17	102	1.5
Total	1,303	1,645	1,281	1,111	1,544	6,884	100.0

6. Cost of Claims and Premiums

All Upstream Oil & Gas Industries

	OCCURRENCE YEAR				
	1996	1997	1998	1999	2000
TRANSACTION YEAR					
1996	$7,833,968	0	0	0	0
1997	$4,884,547	$9,804,301	0	0	0
1998	$4,388,475	$6,766,844	$9,132,605	0	0
1999	$3,964,886	$6,095,794	$7,136,945	$7,610,206	0
2000	$2,993,977	$4,216,829	$5,319,046	$6,814,977	$10,543,966
Total Cost	**$24,065,853**	**$26,883,768**	**$21,588,596**	**$14,425,183**	**$10,543,966**
Total Premiums	**$45,986,075**	**$57,817,292**	**$37,690,984**	**$26,782,733**	**$39,948,197**

The above cost of claims and premiums are for the five-year period 1996 through to 2000. The data is as of May 4, 2001.

The claim cost reflects only paid cost on lost-time claims that occurred in the five-year period. These Costs are tracked by year of occurrence and the year that the costs were transacted.

The premiums are the total premiums paid by employers for each year.

7. Number of Employers that Received/Renewed a COR in 2000

		# Certified	Cert. &Uncert. (# of accounts)	% Certified
SUB-SECTOR # 1:				
Seismic Geophysical Exploration	(Industry # 09200)	3		
Shot Hole Drilling	(Industry # 09201)	0		
Exploration		**3**	**238**	**1.3%**
SUB-SECTOR # 2:				
Oilfield Maintenance & Construction	(Industry # 06304)	**5**	**925**	**0.5%**
SUB-SECTOR # 3:				
Well Servicing with Service Rigs	(Industry # 09903)	**10**	**119**	**8.4%**
SUB-SECTOR # 4:				
Drilling of Oil & Gas Wells	(Industry # 09600)	**6**	**88**	**6.8%**
SUB-SECTOR # 5:				
Field Production Operations	(Industry # 06305)	0		
Vacuum Removal of Waste	(Industry # 06306)	3		
Mud Logging	(Industry # 09900)	0		
Pressure Cleaning Services	(Industry # 09902)	5		
Rathole Drilling/Rig Anchoring	(Industry # 09904)	1		
Downhole Services	(Industry # 09911)	3		
Well Casing Services	(Industry # 09915)	1		
Servicing Christmas Trees	(Industry # 09921)	0		
Liquid Waste Treatment	(Industry # 09927)	0		
Downhole & Other Oilfield Services		**13**	**3,606**	**0.4%**
SUB-SECTOR # 6:				
Mine/Process of Oil Sands	(Industry # 06600)	0		
Oil Sands Research/Development	(Industry #06601)	0		
Tar Sands		**0**	**15**	**0.0%**
SUB-SECTOR # 7:				
Oil/Gas Exploration & Development	(Industry # 06300)	**2**	**2,702**	**0.1%**
SUB-SECTOR # 8:				
Oilfield Trucking Services	(Industry # 50720)	**10**	**737**	**1.4%**
UPSTREAM OIL & GAS SECTOR		**49**	**8,430**	**0.6%**

8. Occupational Fatalities

An occupational fatality is the death of a worker that results from a work-related incident or exposure. Alberta Human Resources and Employment classifies occupational fatalities into three general types: motor vehicle incident, workplace incident and occupational diseases. Each is described in detail below.

Motor Vehicle Incident

Motor vehicle incidents typically involve highway vehicles operating on public roads in which the fatally injured worker was either the driver or a passenger. This category also includes fatalities involving aircraft crashes, train crashes, helicopter crashes, etc.

Workplace Incident

Fatal workplace incidents consist of cases in which the worker dies at a work site, or as a result of injuries sustained at a work site. It is this type of fatality that Alberta Human Resources and Employment may be responsible for investigating.

Occupational Diseases

Occupational disease fatalities consist mostly of recognized occupational disease, that is, disease known to be primarily or exclusively work-related (e.g. asbestosis, black lung disease). Occupational diseases are frequently diagnosed many years after the initial or crucial exposure to the toxic substance, and in such cases it is very difficult to determine when the fatal exposure occurred. Thus, the occupational disease category should not be interpreted to reflect present work site hazardous conditions or exposures.

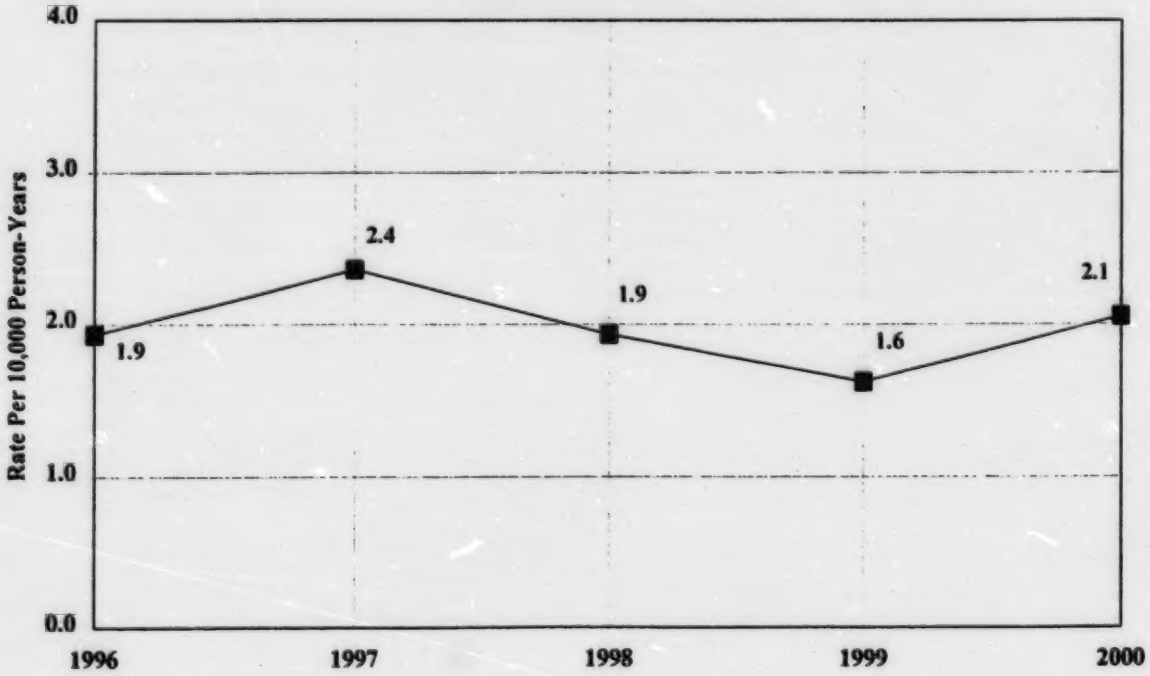
Each year the Workers' Compensation Board (WCB) accepts some occupational fatality claims for compensation. Occupational fatality claims that were accepted in a particular year may include fatalities from prior years.

Fatality rates are estimated by dividing the number of accepted fatalities in the year by the number of estimated person-years in that year. The result is expressed as 'per 10,000 person-years worked'.

Description of Upstream Oil & Gas Workplace Fatalities Accepted by the WCB Alberta: 1995-2000

YEAR	Occupational Diseases		Motor Vehicle Incidents		Workplace Incidents		Total	
	N	%	N	%	N	%	N	%
1996	0	0	8	57.1	6	42.9	14	100
1997	1	5.3	14	73.7	4	21.1	19	100
1998	2	12.5	8	50.0	6	37.5	16	100
1999	1	8.3	6	50.0	5	41.7	12	100
2000	0	0	6	40.0	9	60.0	15	100
Total	4	5.3	42	55.3	30	39.5	76	100

Fatality Rates in Upstream Oil & Gas Industries Alberta: 1996-2000



9. Description of Workplace Fatalities Investigated by OHS: 1996-2000

Sub-Sector 1: Exploration (3)

YEAR: 2000 FILE: 948
OCCUPATION: Driller AGE: 28
INDUSTRY: Shot Hole Drilling
EXPERIENCE: Unknown

DESCRIPTION: The driller and his helper drove a Nodwell 110 tracked vehicle to the staging area to refill the water tank. After refilling the tank, the driller started to drive the Nodwell 110 up the seismic cut line. The helper was seated in the rear of the vehicle cab; neither man was wearing seat belts. The vehicle was three quarters of the way up the steep incline when it started to slip backwards. The Nodwell 110 continued to slide backwards until it rolled on the driver's side. The helper remained inside the cab. The driller, however, was thrown from the cab and was pinned under the vehicle.

YEAR: 2000 FILE: 952
OCCUPATION: Labourer AGE: 44
INDUSTRY: Seismic Geophysical/Mineral Exploration
EXPERIENCE: 7.5 Years

DESCRIPTION: Five workers (A, B, C, D & E) were laying out geophone lines for recording source signals. Three ground crew workers (A, B, C) were planting geophone lines on the ground. Worker D was dispensing lines to the workers on the ground from the deck of the line vehicle. Worker E was driving the line vehicle. Another vehicle driven by a troubleshooter going in the opposite direction, passed the line vehicle and workers, and got stuck in a snow bank. Once the troubleshooter freed the vehicle, he proceeded backwards down the line. While backing up he suddenly heard someone yell at him to stop. At the same time the troubleshooter felt the rear end passenger side the vehicle go up on something. Ground Crew Worker B had been run over by the vehicle.

YEAR: 2000 FILE: 956
OCCUPATION: Seismic Asst./Seismic Blaster AGE: 22
INDUSTRY: Shot Hole Drilling
EXPERIENCE: 8 Months

DESCRIPTION: The seismic drilling crew arrived in the tracked drilling vehicle at their designated start point and proceeded to conduct drilling activities. Prior to leaving the vehicle, the driller updated the explosives recording manifest. He did not see the assistant remove explosives from the vehicle's magazine. The driller exited the cab and commenced drilling activities. Approximately 3 minutes later, he heard an explosion. The driller ran to the north side of the tracked vehicle and found the fatally injured assistant lying in the snow.

The investigation found that a headlamp battery in close proximity to a pre-primed explosive charge might have triggered the explosion.

Sub-Sector 2: Oilfield Maintenance and Construction (1)

YEAR: 1998 FILE: 0891
OCCUPATION: Apprentice Welder AGE: 24
INDUSTRY: Oil Field Construction and/or Maintenance (Upstream of Processing Plants)
EXPERIENCE: 1.5 years

DESCRIPTION: A three person crew was in the process of cutting steel pilings for the installation of an above ground pipeline at the Primrose Lake construction site. The piles had been driven into place in pairs. The piles at the incident scene were long, so a backhoe was required to hold the piles while they were being cut. One of the poles had been cut and pulled down. They were preparing to cut the second pile when the welder appeared in front of the piling just as the backhoe bucket was swinging back to hold the pile. The welder was hit on the right side of his head with the bucket of the backhoe resulting in fatal injures.

Sub-Sector 3: Well Services with Service Rigs and Power Swivels (4)

YEAR: 1996 FILE: 0848
OCCUPATION: Roughneck AGE: 24
INDUSTRY: Well Servicing with Service Rigs
EXPERIENCE: 1.75 years

DESCRIPTION: A service rig was swabbing the contents of an oil well located near Taber, Alberta. The work was being performed as a part of a completion program to bring the well into production. The oil company had contacted the consultant in charge of the job site and asked that swabbing be stopped. They asked that a sample of the produced fluids be take and that tubing be removed from the well so they could seal off the zone producing water. The roughneck took a sample of the produced fluids at the rig tank entry hatch and was later seen standing between the rig tank and the rig pump. The rest of the crew removed the swabbing equipment from the service rig. It is unknown why or when, but the roughneck who took the sample returned and entered the rig tank. As the crew were pulling the tubing, the rig manager found the roughneck who had taken the sample floating in the produced fluids in the tank. The roughneck was rescued by the crew and given two-man CPR until ambulance attendants relieved them. He was transported to the hospital where he was pronounced dead from drowning.

YEAR: 1998 FILE: 0887
OCCUPATION: Derrickman AGE: 33
INDUSTRY: Servicing of Gas and Oil Wells by Means of Service Rigs
EXPERIENCE: Unknown

DESCRIPTION: The worker was in the process of rigging out the tubing board of a service rig. He had connected his fall arrest line and disconnected his positioning lanyard. The fingers on the tubing board had been spread apart and the worker was standing on the diving board. As he turned, the worker slipped and fell through the hole left by the fingers. The worker fell approximately 4 metres until the fall arrest cable tightened. When the cable tightened it separated and the worker fell to the ground. The worker died as a result of injuries sustained in the fall.

YEAR: 1998 FILE: 0888
OCCUPATION: Derrickhand AGE: 26
INDUSTRY: Servicing of Gas and Oil Wells
EXPERIENCE: 4 years

DESCRIPTION: A service rig crew was inserting the last joint of pipe into a well. The derrickhand was working on the tubing board, wearing a harness attached to a 1.8 m (6 feet) working lanyard, anchored to the tubing board rail. After the derrickhand positioned the joint of pipe, the operator instructed him to "rig out" the tubing board (in preparation to dismantle the rig).

In the process of rigging out, the derrickhand transferred from his working lanyard to the retractable lifeline, used for going up and down the derrick ladder. The retractable lifeline was anchored to the crown of the derrick, above the ladder. He was working on the tubing board, therefore the retractable lifeline was across the path of the travelling blocks.

The blocks were still in motion and caught the retractable lifeline, pulling the derrickhand off the tubing board. The blocks sheared the line and he fell to the ground and sustained fatal injuries.

YEAR: 1999 FILE: 0923
OCCUPATION: Operations Manager AGE: 49
INDUSTRY: Servicing of Gas and Oil Wells by means of Service Rigs
EXPERIENCE: 23 years in Oilwell Servicing

DESCRIPTION: An old oilfield pump truck was brought into the company's head office yard for servicing. The Operations Manager asked the worker to back the truck over to a skid-mounted pump in the middle of the yard. The Operations Manager wanted to move the skid mounted pump over approximately two metres to the west.

The Operations Manager stood between the truck and the skid in preparation of wrapping the truck's winch cable around the skid. The worker climbed onto the deck of the truck to operate the winch from the auxiliary control panel. The Operations Manager instructed the worker to increase the throttle to speed up the winch as the cable was reeling out too slow. As soon as the throttle was increased, the truck accelerated backward pinning the Operations Manager between the pump skid and the truck and fatally injuring him.

Sub-Sector 4: Drilling of Oil and Gas Wells (7)

YEAR: 1996 FILE: 0845
OCCUPATION: Floor hand - Oil Well Drilling AGE: 25
INDUSTRY: Drilling Oil & Gas Wells
EXPERIENCE: Unspecified

DESCRIPTION: A crew was in the process of drilling a well. In the process of making a connection, adding a length of pipe to the drilling string, the hammer nut on the swivel caught a horizontal beam on the crown stand. This caused the bottom end of the pipe to whip toward the back of the rig floor. The floor hand was unable to move out of the way and was struck in the face and chest,

and was thrown about 2.5 metres where his head contacted racked pipe. This resulted in fatal injuries to the floor hand.

YEAR: 1996 FILE: 0846
OCCUPATION: Floor hand - Oil Well Drilling AGE: 31
INDUSTRY: Drilling Oil & Gas Wells
EXPERIENCE: 287 hours, total rig experience, 72 hours as a floor hand

DESCRIPTION: A crew was preparing a rig for a move at the time of the incident, by removing and storing pipe from the well. While raising a length of pipe so it could be uncoupled, the breakout tong of the floor man caught on the pipe, rising along with it. The floor hand was caught by the safety cables and pinned against the structure of the rig, causing fatal injuries.

YEAR: 1997 FILE: 0862
OCCUPATION: Floor Hand AGE: 20
INDUSTRY: Drilling of Oil and Gas Wells
EXPERIENCE: Less than one year

DESCRIPTION: The drilling crew was in the process of tripping out drill pipe, when they came to a set of cross over subs. These subs are used to adapt parts of the drilling string, which cannot otherwise be screwed together because of the difference in thread size or design. The crew attached the tongs to the collars and sub and applied torque to break open the joint between the two. The lead tong (tongs are the large wrenches that are latched onto drill pipe or drill collars in order to make up "tighten" or break out "loosen" joint or drill pipe or drill collars) latch lug jaw failed, broke off, and struck the worker in the head fatally injuring him.

YEAR: 1997 FILE: 0877
OCCUPATION: Floorhand AGE: 22
INDUSTRY: Drilling of Oil and Gas Wells
EXPERIENCE: Unknown

DESCRIPTION: An oilrig crew was finishing the process of laying down an oilrig derrick on two bedtrucks, in preparation for the rig move. The worker assisted a gin pole truck operator in rigging the A-leg section of a mast so a spreader bar could be removed and the A-leg lowered. The A-leg was secured to a lifting lug, which was attached to a hook and winch line of a gin pole truck. The worker removed a pin that secured a spreader bar to the derrick and then climbed onto the derrick to remove the spreader bar. The worker polled the spreader bar off, lost his balance and fell forward under the suspended A-leg. Simultaneously, the lifting lug used in lowering and raising the A-legs failed. The A-leg fell on the worker, causing fatal injuries.

YEAR: 1999 FILE: 0918
OCCUPATION: Lease Hand AGE: 25
INDUSTRY: Drilling of Oil and Gas Wells
EXPERIENCE: 39 months on rigs / 69 days on Rig #159SL

DESCRIPTION: The worker was resetting the pipe handling system at the drill rig. To facilitate the pipe transfer process, the transfer arm was to be repositioned to the next tier of drill pipes. A drill pipe, left from the previous transferred layer, was resting on the transfer arm. The worker lost control of the transfer arm when he attempted to reposition it. The drill pipe resting on the transfer arm rolled down and struck the worker on the head. The worker died from serious head injuries.

YEAR: 2000 FILE: 0968
OCCUPATION: Derrickhand AGE: 53
INDUSTRY: Drilling of Oil and Gas Wells
EXPERIENCE: 20 Years

DESCRIPTION: The truck driver was in the process of moving a drilling rig to a lease site. He tried to place the equipment in its proper operating position.

The shack was loaded onto the flatbed. The truck driver tried to back the manifold shack from the flatbed into it's operating position with assistance from a designated swamper, but movement was restricted due to the smaller size of the lease. The driver decided to back his truck to the lease entrance but did not tell the swamper of his intentions. The truck driver started to back up without direction from the swamper. The driller and derrickhand were standing south of the drilling rig's substructure. The driller instructed the derrickhand to get the operator and the dozer to remove some soil by the mud tank. The derrickhand walked away towards the dozer. He was facing away from the truck that was backing up. The truck had an audible back-up alarm system, but the alarm was shut off.

The manifold shack that was hanging off the roll bar knocked the derrickhand down and the truck backed over him.

YEAR: 2000 FILE: 0976
OCCUPATION: Unknown AGE: 32
INDUSTRY: Drilling of Oil and Gas Wells
EXPERIENCE: Unknown

DESCRIPTION: A worker was killed when the travelling block on a drilling rig fell to the rig floor. During the drilling process, the drill collars twisted off down the hole. The drilling crew had been removing the pipe out of the hole to retrieve the drill collars when the travelling block contacted the crown, severing the

Sub-Sector 5:Downhole and Other Oilfield Services (5)

YEAR: 1997 FILE: 0872
OCCUPATION: Truck Driver AGE: 33
INDUSTRY: Field Production Operators
EXPERIENCE: one week with company

DESCRIPTION: The driver was employed with the trucking company to haul methanol to gas leases. The driver attempted to enter the gas lease and his truck became stuck. The lease operator radioed for a caterpillar to pull the truck out. The lease operator and the driver unloaded the methanol and the former left to perform other duties. The cat operator arrived and proceeded to unload the cat off the truck and then backed down the road a short distance. He moved the cat forward through a ditch and a grassy area to the front of the methanol truck. As he manoeuvred the cat in front of the truck, he saw a dark form on the grass. Upon checking, he discovered that the truck driver had been run over by the caterpillar.

YEAR: 1998 FILE: 0909
OCCUPATION: Cement Acid Pumper/Driver AGE: 29
INDUSTRY: Oilfield Downhole Services
EXPERIENCE: 11 months with employer

DESCRIPTION: A worker was found dead in a trench. The worker was one of the two individuals monitoring a pipeline freeze plug operation. Between 25 and 45 minutes after the worker entered the trench, he was found frozen by the other worker and a relief crew. The reason for the worker entering the trench is not known. The purpose of the trench was to expose a section of oil pipeline so that it could be tested for leaks. The pipeline was filled with water to prepare for the leak test. Liquid nitrogen was flowing from a nearby bulk truck through a freeze plug jacket surrounding the pipe. The cold liquid nitrogen on the outside of the pipe froze the water inside the pipe, creating a plug of ice. The freeze plug process created an atmosphere cold enough to freeze the soil in the base of the trench.

YEAR: 1999 FILE: 932
OCCUPATION: Relief Operator AGE: 24
INDUSTRY: Field Production Operators
EXPERIENCE: 3 years

DESCRIPTION: The relief operator and a site consultant noticed a cloud of vapours, steam and smoke rising out of the group treater area at the battery site. The relief operator drove his truck to the battery site to investigate, followed by the site consultant in his own truck. When the relief operator entered the test treater building, the group treater vessel located besides the building exploded and an ensuing fire occurred. The site consultant was forced to retreat as a fireball was shooting towards him. The test treater building was destroyed. The site consultant called Emergency Medical Services. It took approximately 20 minutes to contain the fire. The relief operator received severe burn injuries and was pronounced dead at the scene.

YEAR: 1999 FILE: 0943
OCCUPATION: Operations Manager AGE: 48
INDUSTRY: Oilfield Downhole Services
EXPERIENCE: 25 years

OCCUPATION: Labourer AGE: 19
INDUSTRY: Oilfield Downhole Services
EXPERIENCE: 3 months

DESCRIPTION: An Operations Manager and a labourer were welding an overflow pipe on top of a tank that contained residual flammable materials. During the welding operation the welding spark ignited the flammable materials causing the tank to explode. Both the Operations Manager and the labourer received fatal injuries as a result of the explosion.

Sub-Sector 6:Tar Sands (0)

Sub-Sector 7: Petroleum Producers (1)

YEAR: 1996 FILE: 0828
OCCUPATION: Inspection, Maintenance of Measuring Equipment AGE: 53
INDUSTRY: Oil & Gas Exploration and Development - Upstream Operations
EXPERIENCE: Unknown

DESCRIPTION: The self-employed contractor was in the process of "Gauging" (manually measuring fluid levels) Sour Crude Oil Storage Tanks through openings at the top of the tanks known as "Thief Hatches". The worker was conducting the measurement from an elevated work platform 13' 2" from the ground level. The elevated work platform had guardrails and was connected to ground by a stairway with handrails. Another worker on site witnessed the self-employed contractor go up to the elevated work platform without respiratory protective equipment and/or personal monitoring equipment. The worker became exposed to hydrogen sulfide gases while taking fluid level measurements resulting in losing consciousness and falling over the guardrail of the stairway to the ground.

Sub-Sector 8: Oilfield Trucking Services (0)

Appendix A: Terms, Definitions, and Formulas

Lost-Time Claim

A lost-time claim (LTC) is a claim for an occupational injury or disease, which disables the worker beyond the day of injury. Included are claims for which wages compensation are paid, permanent disability claims, fatalities, and cases in which the injured worker is assigned light duties or other modified work.

Person-Years

Person-year estimates are calculated from wage and payroll data provided by account holders to the WCB. Alberta Human Resources and Employment uses these data to estimate an average industry wage, and uses the average industry wage and employer payroll data to estimate person-years for each employer and each industry. One person-year is equivalent to one full-time worker working for one year, and can be assumed to equal 2,000 hours worked.

LTC Rate

The lost-time claim (LTC) rate is calculated by dividing the number of lost-time claims by the person-year estimate, and multiplying the result by 100. The LTC rate represents the probability or risk of disabling injury or disease to a worker during a period of one-year work. Comparisons of LTC rates between industries, or between years, can be used to indicate increases, decreases, or differences in this risk.

$$\text{LTC Rate} = \frac{\text{Number of LTCs X 100}}{\text{Estimated Person-years}}$$

Duration (Days Lost)

The duration of disability is the number of days following the injury or disease for which the worker was disabled, and unable to perform normal work duties. This information is obtained for this report from data on compensation days paid on each claim from WCB. Alberta Human Resources and Employment obtains these data on March 31 of the year following the claim year, and does not update the information, even though many injured workers continue to be disabled beyond this date. As a result, the duration information reported here underestimates the true impact of lost-time injury and disease.

Duration Rate

The duration rate is calculated by dividing the number of workdays lost (disability days) by the person-year estimate, and multiplying by 100. The result is expressed as days lost per 100 person-years worked, and indicates, in part, the economic impact of occupational injury and disease. Duration rates are not recommended as reliable indicators of full economic cost. In addition, readers are warned that duration rates are highly unstable when based on only a few lost-time claims; it is recommended that the duration rate not be calculated based upon fewer than 30 lost-time claims.

$$\text{Duration Rate} = \frac{\text{Disability Days X 100}}{\text{Estimated Person-Years}}$$

Industry Coverage

This report includes all industry activity in Alberta covered by the Alberta WCB for occupational injury and disease to workers. Most industry sectors are included but notable exceptions include agriculture and finance. Several professional groups (e.g. the teaching and medical professions) are also excluded. Government of Canada is excluded except where the WCB pays administration or enhanced disability cost. Claims from the Government of Alberta employees are only included if the duration is longer than 80 days. About 75% of employed persons in Alberta are represented in this report.

WCB Accepted Fatality

An occupational fatality is the death of a worker which resulted from a work-related incident or exposure and which has been accepted by the WCB for compensation. A fatality is counted in the year it is accepted.

Fatality Rate

The fatality rate is calculated by dividing the number of accepted fatalities by the person-years estimate and multiplying the result by ten thousand. The result is expressed as fatalities per 10,000 person-years worked.

$$\text{Fatality Rate} = \frac{\text{Number of fatalities X } 10{,}000}{\text{Estimated Person-years}}$$

NEC

Means 'Not Elsewhere Classified'.

UNS

Means 'Unspecified'.

Appendix B: Upstream Oil and Gas 2000 Industry Codes

Sub-Sector 1: **Exploration**
Industries: 09200~Seismic Geophysical/Mineral Exploration
09201~Shot Hole Drilling

Sub-Sector 2: **Oilfield Maintenance and Construction**
Industries: 06304~Oilfield Construction and/or Maintenance

Sub-Sector 3: **Well Servicing With Service Rigs**
Industries: 09903~Well servicing with Service Rigs including Power Swivels

Sub-Sector 4: **Drilling of Oil and gas Wells**
Industries: 09600~Drilling of Oil & Gas Wells

Sub-Sector 5: **Downhole & Other Oilfield Services**
Industries 06305~Field Production Operators
06306~Vacuum Removal of Waste
09900~Mud Logging
09902~Pressure Cleaning Services
09904~Rathole Drilling and Rig Anchoring
09911~Oilfield Downhole Services
09915~Well Casing Services
09921~Servicing Christmas Trees On Oil Wells
09927~Liquid Waste Treatment & Disposal

Sub-Sector 6: **Tar Sands**
Industries: 06600~Mining & Processing of Bituminous Sand
06601~Research/Development, Oil Sands and Heavy Oil Recovery

Sub-Sector 7: **Oil & Gas Exploration/Development**
Industries: 06300~Oil and Gas Exploration & Development-Upstream Operations

Sub-Sector 8: **Oilfield Trucking Services**
Industries: 50720~Oilfield Trucking Services

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http://www.whs.gov.ab.ca